

Re-introducing fire at the urban/wild-land interface: planning for success

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Summary

The application of fire in the southern United States continues to increase in complexity due to urban sprawl, air quality issues and regulatory constraints. Many sites suffer from unnaturally high fuel accumulations due to decades of fire exclusion. The loss of habitat to urbanization and successional changes resulting from the absence of fire increases the importance of restoring and maintaining those remaining acres. The wild-land/urban interface case study we discuss herein includes several fire-adapted plant communities ranging in required fire regime from frequent low-intensity fires to infrequent high-intensity stand replacement fires. This area has experienced extended fire-free periods and includes tightly packed homes in subdivisions developed with no consideration of the potential for wild-land fire. Additional smoke-sensitive areas include schools and heavily travelled highways. Such worst-case scenarios exponentially increase the challenges/risks facing fire managers. This case study thus illustrates many of the complex societal issues and technical challenges facing fire managers when planning and conducting restoration burns in the wild-land/urban interface. In fact, it reinforces the notion that, when burning in the wild-land/urban interface, executing the burn often requires less effort than the planning, co-operation and co-ordination necessary prior to ignition.

Introduction

Fire managers in the United States took organized notice of the wild-land/urban interface as a national phenomenon for the first time in 1985 (Cortner, 1991; Pyne, 1993; National Interagency Fire Center, 1994). By 1991 the wild-land/urban interface had been identified as a global concern (Ewert, 1991), and has since been recognized as a challenge that will continue to grow in scale and

complexity (Robinson, 1993; Morgan *et al.*, 2001). This presents fire managers with a real dilemma, one that they will have to approach aggressively if they intend to manage rather than react (Pyne, 1993; Robinson, 1993; National Interagency Fire Center, 1994; Morgan *et al.*, 2001).

The latest forest survey for the south-eastern United States identified urban and suburban development as the source of the greatest loss of

forest-land, which makes the maintenance/restoration of remaining habitat critical (Frost, 1993; Outcalt and Sheffield, 1996; Wear and Greis, 2001). Many of the islands of naturally vegetated land in the urban interface have been deprived of the frequent fires that are required for their very survival (Kalobokidis, 1998; Outcalt, 2000; Rideout, 2003). This is especially true for longleaf pine (*Pinus palustris* Mill.) sand hills and sand pine (*Pinus clausa* Engelm.) scrub. Longleaf pine requires frequent low intensity fire (Florida Department of Natural Resources, 1990; Outcalt and Sheffield, 1996; Outcalt, 2000). Sand pine requires infrequent high intensity stand-replacing fire (Florida Department of Natural Resources, 1990).

This dilemma puts fire and land managers in the proverbial hot seat. The fire manager needs to protect homes in the urban interface from wild-land fire and highways and other sensitive areas from smoke. The land manager needs to return fire to natural communities dependent on it for their existence. Both of them need to reduce fuel loads to protect values at risk. While fire is not the only option to efficiently reduce hazardous fuel accumulations within the urban interface, it is the only choice that will also restore function to these deteriorating natural communities. Efforts to reconstruct historical fire regimes as a prerequisite to restoring function to ecosystems are not confined to the United States. In fact such efforts are taking place around our planet (Lewis, 1982; Goldammer, 1994; Pyne, 1995; Williams, 2000).

Prescribing and implementing the burn

The site

The St Johns River Water Management District (SJRWMD) purchases land for the purposes of protecting water quantity and quality. The SJRWMD's legislative charge is 'to manage and maintain land, water and related resources in an environmentally acceptable manner, and to the greatest extent practicable, to restore and protect their natural state and condition' (Florida Statutes 2002: Section 373.59). As a part of that mission, the District purchased 681.5 hectares (1684 acres) of land surrounding Moses Creek in St Johns County, FL, USA in 1995. This purchase

became known as the Moses Creek Conservation Area. The State of Florida uses a natural community classification system developed by the Florida Natural Areas Inventory (Florida Department of Natural Resources, 1990). Natural communities in the conservation area consisted of longleaf pine sand hills, flatwoods of predominantly longleaf and slash pines (*Pinus elliotii* Engelm. var. *elliotii*), sand pine scrub, floodplain marsh, hardwood hammocks, cypress (*Taxodium distichum* (L.) Rich.) swamp and floodplain swamp. All but the hammocks and floodplain swamp are dependent on fire for their continued existence (Florida Department of Natural Resources, 1990).

Prior to purchase by the District, the property had been managed for timber production and recreational hunting. No prescribed fire had been used in decades. At least two wildfires had occurred in the 5 years prior to purchase. While intense, those fires were both extinguished by aggressive fire suppression. Fire exclusion had resulted in tremendous fuel loads and successional changes away from fire climax communities. Fuel accumulations and successional changes were most pronounced in the longleaf sand hill communities and the sand pine scrub. Maintenance and/or restoration of these communities required prompt action to reintroduce fire.

While these natural changes were occurring, man-made changes were making the reintroduction of fire more urgent and more difficult. Urbanization surrounded the Moses Creek Conservation Area. Subdivisions, which placed higher priority on environmental aesthetics and privacy than on fire safety and access, sprang up immediately adjacent to the Conservation Area. The threat posed to these subdivisions by wildfire was extreme. While action was necessary to reduce the risk of wildfire to these subdivisions; their very presence, their design and the highway traffic they generated made the process of reducing the risk much more difficult. Reintroduction of fire became essential for the continued healthy and safe existence of both the natural and man-made communities.

The Moses Creek Conservation Area is situated between one major highway (US 1) on the west, one minor highway (SR 206) on the south, and the Intercoastal Waterway on the east (Figure 1). No smoke can be tolerated on US 1

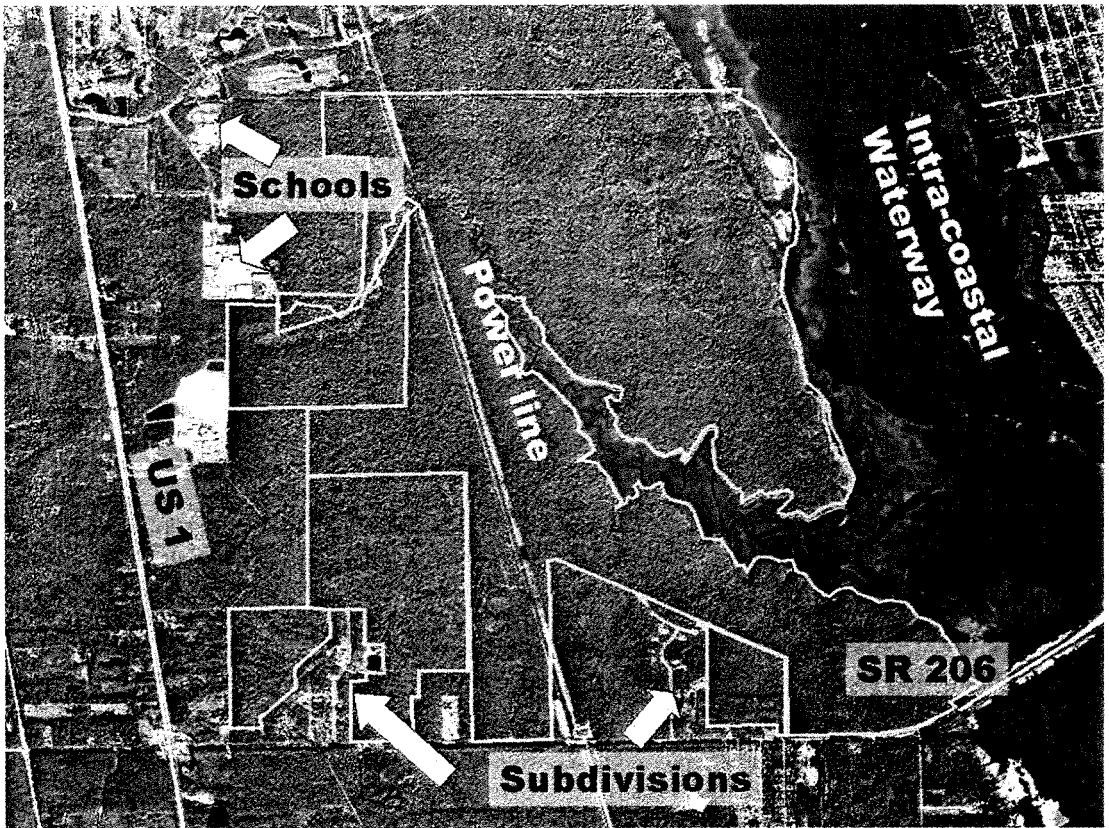


Figure 1. Map of Moses Creek Conservation Area and vicinity showing fire/smoke sensitive areas, St Johns County, FL, USA.

because of the volume and high speed of traffic. Ensuring that smoke will not impact US 1 is complicated by the proximity of the Moses Creek Conservation Area to the Intercoastal Waterway and the Atlantic Ocean. Sea breezes off the water are likely to push smoke on to the highway regardless of the general winds. The wind direction least likely to have smoke impact on US 1 is a north-west wind; however, a north-west wind is likely to create smoke impacts on SR 206.

Four subdivisions and two public schools must be protected from smoke impacts. While three subdivisions also required protection from direct flame impacts, two of these subdivisions (Hidden Creek and The Pines) have only one access road to enter and exit the community. Neither have municipal water supplies or fire hydrants. Hidden Creek exacerbated their fire risk by requiring the homeowners to impact only 40 per cent of their

lot with the construction of the home, driveway, yard and any other areas of non-native vegetation. This requirement resulted in owners building their home on most of the 40 per cent allowable area and having flammable natural vegetation actually touching the home on all sides. This requirement also minimized the size of driveways, thereby making it impossible for structural fire apparatus to approach the homes.

Planning

While the St Johns River Water Management District is entirely responsible for the restoration and maintenance of the natural communities within Moses Creek Conservation Area, at least three agencies share responsibility for managing the threat of wildfire to the homeowners. The St Johns River Water Management District, the

Florida Division of Forestry (the agency statutorily responsible for all wild-land fire in Florida) and St Johns County Fire and Rescue share the concern over wildfire leaving the conservation area and threatening homes. In the autumn of 1996 these three agencies met to discuss the problem.

At the 1996 meeting it was agreed that aggressive action was necessary to reduce the wildfire threat in the urban interface surrounding the Moses Creek Conservation Area. The participants also agreed that, given the circumstances, no single agency had the resources necessary to implement prescribed fire in the area. In fact it would be necessary to form a partnership of seven agencies and/or organizations (St Johns River Water Management District (SJRWMD), Florida Division of Forestry (FDOF), St Johns County Fire and Rescue (SJCFR), St Johns County Sheriff's Department (SJCSO), Florida Highway Patrol (FHP), Florida Department of Transportation (FDOT) and Florida Power and Light (they have a major transmission line within the conservation area)) to be successful. It was agreed in advance that if any one agency was uncomfortable with the planned prescribed burn that the entire operation would not be conducted. A burn plan for Moses Creek was developed and each agency was asked if they were comfortable with, and could successfully support, their portion of the plan. Because the plan was developed using the Incident Command System and each agency's role was limited to their area of expertise every-

one involved was comfortable with the plan (Table 1).

Because implementation of the burn would require a large commitment of personnel and equipment, and because the prescription window in which the burn could be successful without smoke impacts was so narrow, it was decided to use aerial ignition and to burn almost the entire conservation area in 1 day. The burn was divided into three divisions (Figure 2) to allow it to be confined quickly if conditions deteriorated and to minimize access challenges to fire apparatus. Each division could be isolated and the breaks were minor tributaries to Moses Creek. This prevented ground resources from having to cross creeks to patrol their division.

The following equipment was necessary to execute the burn: three tractor plough units (one per division), six type VI engines (300 gallon), one helicopter with ignition and suppression capabilities, two strike teams of structural engines, two 6000 gallon water tenders, three horses for lighting the blackline and patrol, two programmable electronic traffic signs in case closure of SR 206 was necessary, two law enforcement patrol vehicles and one ambulance. The plan called for a total of 52 personnel.

Preparation

Once all partners approved the plan, preparations for the burn began. Firelines were mowed to

Table 1: Prescribed fire responsibilities for a restoration burn planned and executed on Moses Creek conservation Area, St Johns County, FL, USA

Task	Agency responsible
Command	Unified between St Johns River Water Management District and Florida Division of Forestry
Public information	Unified between St Johns River Water Management District, Florida Division of Forestry, St Johns County Fire Rescue
Ignition	Florida Division of Forestry
Holding	Florida Division of Forestry in charge with resources from Florida Division of Forestry and St Johns River Water Management District
Traffic control	St Johns County Sheriff's Department and Florida Highway Patrol
Closing 206 if necessary due to smoke	Florida Department of Transportation
Preparation of control lines in advance	St Johns River Water Management District
Structure protection	St Johns County Fire Rescue
Water supply	Florida Division of Forestry
Logistics	St Johns River Water Management District



Figure 2. Map showing divisions of the planned burn on Moses Creek Conservation Area, St Johns County, FL, USA.

reduce vegetative debris and then ploughed to mineral soil. They were then harrowed to improve vehicular access.

Teams of public information personnel canvassed the four neighbourhoods that would be exposed to the burn or smoke. Door hangers and literature were left at each of ~140 homes within 1 mile of the burn. Public Service announcements and press releases for local newspapers, television and radio stations were provided in advance.

Twenty-two residents of Hidden Creek reacted negatively to the proposed burn and command staff met with the homeowners association twice before their fears were allayed and their endorsement given. Thirteen homeowners did ask to be called the day before the burn so they could be home to observe the operation. A phone list was developed of everyone who needed to be called. Added to that phone list were four names of people in the affected area who suffered from a

breathing ailment including asthma, emphysema, etc. The team arranged for the notification and relocation to an area hotel of anyone with smoke intolerance due to respiratory illness.

Once all preparations were made, the next step was to wait for the required prescription window. The exact weather conditions necessary only occur in the winter months in Florida (November–March).

Executing the burn

The first prescription window arrived in mid-January 1998. Everyone was notified, all personnel and equipment were assembled on site but an unpredicted rain shower prevented the burn from occurring. Everyone was released and notified to be prepared for the next window of opportunity.

On 30 January 1998 the forecasted weather fit the prescription. Again everyone was notified and

all equipment and personnel assembled. This time the forecast was more accurate and the burn began. Unfortunately, only 113 ha (280 acres) in Division A burned before an unforeseen sea breeze developed. The sea breeze and the general wind collided over Division B creating a situation where there was no wind and burning conditions deteriorated. Since the burn was no longer in prescription, ignition was stopped and the burned area was mopped up.

Results and discussion

While the entire planned area did not burn, the effort was deemed a success because it achieved the following:

- 1 Seven agencies came together and executed a complex plan to complete a difficult burn. This exercise established strong bonds of co-operation that continue.
- 2 One hundred and thirteen hectares were burned without incident. Fuel loads were reduced and restoration begun.
- 3 Homeowners were educated about fire ecology, wildfire risks and prescribed burning. They also developed a higher confidence level regarding burning and prescribed burns.

Incidentally, the spring of 1998 brought one of the worst wildfire seasons on record to Florida. Moses Creek Conservation Area is located in the middle of the area that was hit hardest by the wildfires of 1998. Homeowners in Hidden Creek

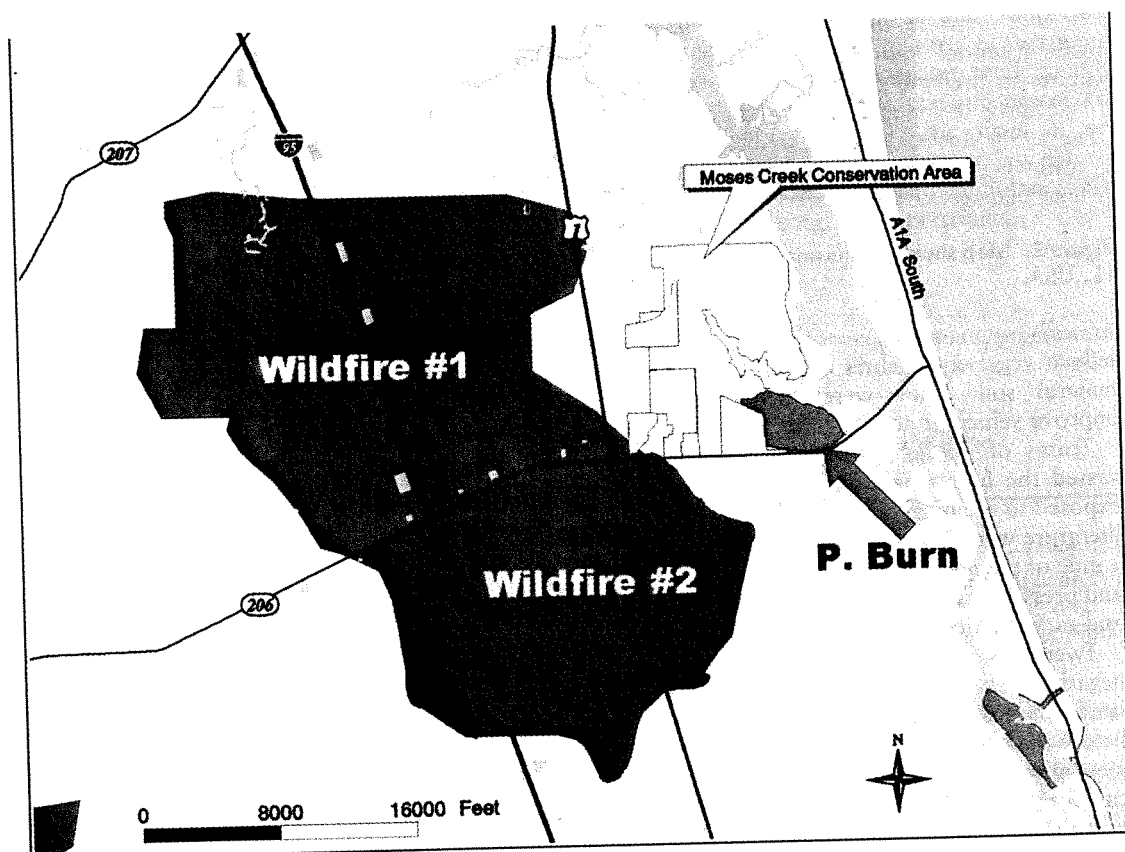


Figure 3. Map showing proximity of June 1998 wildfires to Moses Creek Conservation Area, St Johns County, FL, USA.

were evacuated twice as two different wildfires converged on them from the west, north-west and south-west (Figure 3). As a result of the successful prescribed burn and the threat of nearby wildfires, support for additional prescribed burning among the homeowners in Hidden Creek remains high. In fact, some of those who were the staunchest critics of the burn during those first two homeowner meetings have now become some of the strongest supporters of future burns.

Conclusion

Decades of fire exclusion have led to increased fuel loads and significant changes in natural communities. These changes are especially important since many of the rarest natural communities are fire dependent. As urbanization continues, public lands will become increasingly important to provide essential habitat. All of this will put pressure on fire/land managers to conduct prescribed burns in the wild-land/urban interface.

The 1998 Moses Creek prescribed burn offers the following lessons that may be invaluable to fire/land managers everywhere:

- 1 Identify all of the potential participants and foster co-operative partnerships early. Break down the roles of each partner into manageable pieces. If the steps are properly broken down even some of the most difficult burns can become possible.
- 2 Start the education process with the neighbours early and invest adequate time to develop their understanding.
- 3 Staff and equip the burn to deal with any contingency. Make the resources visible to increase homeowner confidence.
- 4 Recognize that most of the effort, energy and time go into planning and preparation. The actual execution of the burn is often the shortest and sometimes the easiest step.

References

- Cortner, H.J. 1991 Interface policy offers opportunities and challenges: USDA Forest Service strategies and constraints. *J. For.* 89(6), 31–34.
- Ewart, A. 1991 The wildland urban interface: future forest management near large cities. In *Proceedings of the 10th World Forestry Congress*, Paris, France, 16–26 September 1991, S.A. Dembner (ed.). Food and Agriculture Organisation of the United Nations, Rome, Italy, pp. 347–353.
- Florida Department of Natural Resources 1990 *Guide to the Natural Communities of Florida*. Tallahassee, FL
- Florida Statutes 2002 Section 373.59, Water Management Lands Trust Fund.
- Frost, C.C. 1993 Four centuries of changing landscape patterns in the longleaf pine ecosystem. *Tall Timbers Fire Ecol. Proc.* 18, 17–43.
- Goldammer, J.G. 1994 Interdisciplinary research projects for developing a global fire science. In *Proceedings of the 12th Conference on Fire and Forest Meteorology*, 26–28 October 1993, Jekyll Island, GA. Society of American Foresters, Bethesda, MD, pp. 6–22.
- Kalaborkidis, K.D. and Omi, P.N. 1998 Reduction of fire hazard through thinning residue disposal in the urban interface. *Int. J. Wildland Fire* 8(1), 29–35.
- Lewis, H.T. 1982 Fire technology and resource management in aboriginal North America and Australia. Chapter 2 in AAAS #67: *Resource managers: North American and Australian hunters and gathers*. N.M. Williams and E.S. Hunn (eds). American Association for the Advancement of Science, Washington, DC.
- Morgan, P., Neuenschwander L.F. and Swetman, T.W. 2001 *Testimony to the Subcommittee on Forests and Forest Health*. Committee on Resources, US House of Representatives.
- National Interagency Fire Center 1994 *Fire Protection in the Wildland Urban Interface: Everyone's Responsibility*. Boise, ID.
- Outcalt, K.W. 2000 Occurrence of fire in longleaf stands in the southeastern United States. In *Fire and Forest Ecology: Innovative Silviculture and Vegetation Management*. W.K. Moser and C.F. Moser (eds). *Tall Timbers Fire Ecology Conference Proceedings*, No. 21. Tall Timbers Research Station, Tallahassee, FL, pp. 178–182.
- Outcalt, K.W. and Sheffield, R.M. 1996 The longleaf pine forest: trends and current condition. *Resource Bulletin SRS-9*. Department of Agriculture, Forest Service, Southern Research Station, Asheville, NC.
- Pyne, S.J. 1993 The path of fire: from the wilderness era to the ozone layer. In *Proceedings on the Workshop on the Power of Politics, the Media and the Public to Affect Wildland/Urban Fire Protection Programs in the 1990's*. G. Wallace (ed.), The National Wildfire Foundation, Missoula, MT, pp. 72–75.
- Pyne, S.J. 1995 *World Fire: The Culture of Fire on Earth*. Henry Holt, New York.